An artificialist theory of the firm: contours and perspectives

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Abstract

There is nothing new in applying the concept of artificiality to organizations; however, few researchers have followed Simon's suggestion, put forward in the early 1940s, that firms should be considered artifacts. The present article attempts to remedy this situation by outlining the contours of an artificialist theory of the firm. The design process is shown to be at the heart of the artificialist approach; therefore, the firm can no longer be represented purely in terms of choices between available alternatives. Highlighting the central role of design also leads theories of the firm to integrate the concept of creative rationality, alongside the idea of bounded rationality. As well as providing a positive vision of the firm, the artificialist approach discards the idea of natural evolution in favor of artificial evolution.

Key words

Artificialism, design process, theory of the firm, bounded rationality, creative rationality, H.A. Simon.

Classification JEL: D20, D21, L 23, L 25.

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There is nothing new in applying the concept of artificiality to organizations. In "*Some Building Blocks for a Theory of the Firm as a Real Entity",* Gindis showed that controversy over whether a firm is a *fiction* or whether it is a *real entity* existed as early as the end of the 19th century (Gindis 2007). At this time, the debate centered round the question of whether the firm should be considered a natural object or an artificial object.

Since the middle of the 20th century, most theoreticians have accepted the idea of the firm as an artificial entity; however, very few have examined this artificiality. The writings of Hayek provide a clear illustration of this point: although Hayek defined the firm as an intentionally created construct (*purposeful construct*), his analyses focused on market coordination, thereby neglecting the functioning of purposeful constructs (Ioannides 1999).

One of the first researchers to describe the firm as an artifact; that is to say, as an entity designed by humans in order to satisfy their needs, was Simon in 1943. Continuing to develop this thesis, in 1969 Simon asserted that there is no reason to confine the concept of artifact to simple technical objects (Simon, 1969)[1].

The route revealed by Simon is still very early in its development. As Forest and Micaelli (2002) underlined if considering a 'technical object' an artifact and looking into its original design for the causes of its existence and into its successive redesigns for its dynamic does not seem to pose any particular problems, it must be admitted that recognizing the organization as an artifact, and then conceiving a science dedicated to it, invokes reticence on the part of theoreticians and practicians, or, at best, it leaves them doubtful. It is certainly the reason for which the current state of a science for organization design is fragmented and immature (Jelinek, Romme, and Boland 2008).

The goal of the present article is neither to strengthen the scientific basis for organizational design by a comprehensive study of specific design methods and techniques (Starbuck, Dunbar 2006) nor to emphasize design as professional practice (Buchanan 2008). This article aims to examine the possibility and value of integrating the artificialist concept into modern theories of the firm. The first step in this process is to show that the firm can be considered an artifact. For Simon, this meant demonstrating that

the firm exists in order to meet one or more objectives and that its structure is the result of a design process. The second part of the article discusses the contribution the artificialist theory can make to modern theories of the firm, by examining how an artificialist approach provides a new perspective on the nature of the firm, and how it explains the dynamics of the firm.

1. TOWARDS AN ARTIFICIALIST THEORY OF THE FIRM

Simon is well known amongst theoreticians of the firm for his work on bounded rationality and on the decision-making procedures organizations adopt; however, his reflections on the artificial nature of the firm have not received as much attention. As Simon's reflections on artificial objects are disseminated throughout his work, the following discussion begins by summarizing his arguments for developing an artificialist point of view (section 1.1). Although there are substantial differences between firms and technical objects, consideration of the specific characteristics of firms shows that they can be considered artifacts (section 1.2). By combining the view of the firm as an artifact with notions developed in the sciences of design, it is possible to define the contours of an artificialist theory of the firm (section 1.3).

1.1. SIMON'S POINT OF VIEW

Although viewing the firm as an artificial entity was not new, Simon was the first theoretician to present the firm as an artifact. In the introduction to *Sciences de l'Intelligence, Sciences de l'artificiel*, Demailly and Le Moigne (1986) highlighted the audacity of Simon's thesis, which argued that social organizations do not just materialize; they are designed. Simon developed this thesis further in *Administrative Behavior*, where he maintained that designing an organization is very similar to designing a building (Simon, 1947), and in *The Sciences of the Artificial*, where he argued that the notion of artifact does not apply only to simple technical objects (Simon 1969).

According to Simon, an artifact can be considered as such if, and only if, it is designed to meet a need. Hence, in order to classify an object as an artifact, it is first necessary to demonstrate the existence of a goal, as all design processes are initiated to meet a series of heterogeneous, incomparable or even contradictory objectives.

It is now commonly accepted that organizations are formed to meet a set of objectives, or that "*lists of desiderata that must be attended to could be drawn up for designing organizations*" (Simon 1995:251). For example, according to Davis: "*Organizations are social inventions, that is, they are created by people for specific purposes at a particular time in history (...). The structure of an organization reflects the objectives it sought to accomplish"* (Davis 1982:213). In the first chapter of *Economics, Organization and Management*, Milgrom and Roberts used a comparison of organizational models in the automobile industry to underline the fact that the success (or failure) of a mode of organization is correlated with its suitability for attaining the organization's goals.

The second step is to demonstrate the existence of a design process[2]. The importance of the design process has been stressed by a number of authors: "*Engineering and organizational design deal with different entities but the process is the same"* (Muster and Weekes 1985:137); *"design process (...) the process of inventing or creating or forming an organization within which the efforts of many people are combined and coordinated to achieve the goals crucial to the organization's survival and success"* (Davis 1982:211).

1.2. SPECIFICITY OF THE FIRM

It was on these two propositions that Simon based his thesis that organizations can be considered artifacts in the same way that all technical objects and, more generally, all material and immaterial objects designed by humans are artifacts. But is there really no difference between an organization and a simple technical object?

Some may put forward ontological arguments about the inherent and immutable characteristics of organizations in order to argue against drawing such a conclusion too rapidly, suggesting that it is not in the nature of the organization to be an artifact. Nevertheless, such arguments are more about the inherent characteristics of the organization than about the impossibility of considering it an artifact.

Others may point out that there are at least two notable differences between the design process for an organization and the design process for a technical object. This point of view is incontestable. The first difference concerns the way people involved in designing an organization consider their function: they rarely see themselves as designers. The second difference is that, unlike the design of mechanical

systems, organizations are designed without specifications and the chosen organizational concept cannot be tested *ex ante*, as it is impossible to accurately anticipate the representations and behaviors of the actors immersed in this type of artifact.

But do these differences, which are in no way comprehensive, rule out the possibility of considering organizations artifacts? The answer to this question is no because the differences between the design processes for an organization and for a vehicle are no greater than the differences between the design processes for a computer program and a public space, or between the design processes for an aircraft's undercarriage and the braking system for a scooter.

In addition, recognizing that very different mechanisms may be involved in the production of different artifacts once again highlights the specific and inherent characteristics of the organization, rather than the impossibility of considering it an artifact and studying its design.

1.3. THE FIRM AS AN ARTIFACT

Simon was under no doubt that the firm is an artifact. At the same time, in *The Science of the Artificial*, he described the objectives and particularities of the sciences of design, or science of the artificial, and defined a program of research for the sciences of design[3]. For Simon, the sciences of design aim to explain how the multiple "artifacts" that characterize human societies are designed "*how things ought to be in order to attain goals*". He contrasted this with the natural sciences, whose purpose is to study "*how the world is*" (Simon 1969).

The change of perspective required by the sciences of design is not at all trivial. It involves considering the artificial world as resulting from the actions humans take to modify their external environment in order to satisfy their needs. Adopting this point of view means accepting that the focus of the sciences of design is not the *object* itself (the artifact in its existential reality); rather it is the *process* that led to the production of the object " *The artificial world is centered precisely on this interface between the inner and the outer environment. It is concerned with attaining goals by adopting the former to the latter. The proper study of those who are concerned with the artificial is the way in which that adaptation of means to environments is brought about and central to that is the process of design itself* " (Simon 1976:132). This led Le Moigne to stress the fact that the artificialist "*knows for*

certain why and how the object was produced; rather than being limited to hypothetical speculations on the origin of natural objects: transformism, evolutionism, genetics, natural selection, divine creation" (Le Moigne 1995:157). Hence, it is a question of accepting that artifacts have no metaphysics, that is to say, their existence cannot be attributed to forces beyond human understanding or human action.

If the idea that the firm is an artifact is seriously considered since the beginning of the 2000s (Starbuck and Dunbar 2006; Buchanan 2008; Jelinek, Romme, and Boland 2008), what contribution an artificialist theory of the firm can make to modern theories of the firm ? Does it provides a new perspective on the nature of the firm ? How does it explain the dynamics of the firm ? How does such a point of view relate to existing theories? These questions are addressed in the following parts.

2. LESSONS FROM AN ARTIFICIALIST THEORY OF THE FIRM.

Modern theories of the firm agree that the firm should be recognized as a central entity of economic activity. This perspective has led to the rejection of the neo-classical analytical framework, which did not allow the true nature of the firm to be understood, as it was based on a production function view in which the firm was considered a black box.

The existence of the firm is addressed in two main ways by modern theories. Contracting nexus theory and transaction costs theory present firms as arising by default, that is to say, when there are market failures. The theory of resources and competencies (TRC)[4] considers the firm to be both a collection of resources/competencies and an entity with an ability to learn, with the intimate conviction that firms are inherently efficient.

The following section describes briefly the design process of the firm (section 2.1). Thus it leads to note that the artificialist theory shares the TRC's positive vision of the firm (section 2.2). It allows to underline the relation between the architecture formed and the designer's actions (Section 2.3). The last section stresses that the artificialist theory of the firm is not reduce to choosing a predefined organizational structure 'off the shelf', in order to match a particular environmental constraint (Section 2.4).

2.1. THE DESIGN PROCESS OF THE FIRM

As mentioned above, the sciences of design focus on the process. Thus, in order to understand what an artifact is, it is necessary to understand the purpose for which it was made. Its essence is in its function (what it was made for), not in its organic composition or its utility. The adaptation criterion for the actors involved in designing an artifact is to match the level of adjustment to the need. From an objective point of view, the performance and the dynamic of an artifact must therefore be studied in terms of its functional capacity (does it still meet the need?) or its dysfunctional capacity (what dissatisfactions have resulted from its existence or its use)? The corollary of this statement is that good designers are designers who use their expertise to match functions to needs, rather than to try and achieve perfection.

Applied to the firm, it means that the firm's performance must be evaluated in terms of how well the organizational concept satisfies the functions for which it was designed (create value, integrate actors with knowledge in a variety of fields, coordinate theses actors, develop a learning capacity, develop a capacity for innovation, etc), and how well it meets the constraints a firm faces (obey labor laws, take into account the firm's resources[5], etc). These two aspects can be referred to as the firm's Vector of Objectives and Constraints (VOC).

Accepting that organizations are largely structured by the objectives for which they were designed, and therefore by the way performance was defined when they were designed, shows why it is risky to import, unmodified, an existing organizational design "*As familiar and rational as the functional hierarchy may be, there are distinct disadvantages to blindly applying the same form of organization to all purposeful groups. To understand the problem, begin by observing that different groups wish to achieve different outcomes... different groups have different members... The danger is that the patterns of activity that help one group to be successful may be dysfunctional for another group, and actually inhibit group effectiveness*" (Roy 2002).

Analyses of designers' actions[6] show that designers not only have to define the desired functions (referred to as 'problem forming' by Simon), they also have to spend considerable time and energy generating acceptable alternatives, that is to say, seeking an internal architecture (the structuring of the organizational design itself) suited to the firm's VOC. Hence, design involves a process of problem forming and solution finding, so a final choice can be made from available alternatives[7]. Simon's work

clearly distinguishes between design and choice. Moreover, he pointed out that design is not merely a matter of choosing between existing alternatives, as most design resources used by designers are dedicated to discovering or generating alternatives, rather than to choosing one alternative (Simon 1995).

2.2. A POSITIVE VISION OF THE FIRM

Like the TRC, the artificialist theory offers a positive vision of the firm because the existence of firms is not merely a response to market failures. As many technical objects are highly complex (10^4 parts for an automobile or a helicopter), they can only be produced by bringing together knowledge in a large number of fields: due to the specialization of knowledge, this knowledge cannot be possessed by a single person (Maskell 2001). The internal architecture the "manager-designer" produces allows the coherent integration of this knowledge and gives the firm an inherent effectiveness that cannot be achieved by single individuals.

Although there are many similarities between the TRC and the artificialist approach on this point, the artificialist theory differs from the TRC by highlighting the fact that it is the way the organizational design mobilizes knowledge, rather than the knowledge itself, that produces the competitive advantage[8].

Possessing all knowledge, even if this were possible, or possessing the greatest "experts" will not necessarily generate greater value; the most important factor is the ability of the organizational design to orchestrate this knowledge in a harmonious way in the time available. In fact, being subject to a time constraint is an intrinsic characteristic of design. This explains why firms sometimes call upon external knowledge: being aware of the time it would take to acquire new and specific knowledge, because of its capacity for learning (Foss 1996) and the effect of cognitive distance (Nooteboom 2000), a firm may decide that bringing in external knowledge is worthwhile, despite the potential risks related to its high specificity (Williamson 1994).

2.3. DESIGNER'S ACTION

The coherence of the architecture formed is due to the designer's actions; it is not a result of natural phenomena, and even less a consequence of miraculous invention Moreover, the emergence of

the organizational concept is even less independent of the designer who began the design process than it is of the firm's VOC. The organizational concept is also influenced by the order in which the elements of the VOC are considered (Simon 1995), the cognitive abilities of the designer (see below), and the designer's frameworks (Schön 1995) or conceptual artifacts[9].

In his book *Images of Organization*, Morgan (1988) showed that successive theories of the organization are all based on images and metaphors, whether of the machine, the living organism, the brain or self-poietic processes, and that these images and metaphors have modified our ways of understanding the structure and functioning of organizations. Morgan's approach can be used to compare theories of organizations, to show their dependence on their material and cognitive environments, and to draw attention to the organizational blockages that can be caused by over-slavish application of the conceptual reference model (Perrin 1994).

2.4. A THEORY NOT REDUCED TO CHOICE

The artificialist theory is a break with theoretical analyses of the firm based on choices between existing alternatives. At first sight, this would seem to suggest that the artificialist theory is incompatible with the TCT of Williamson, who presents the trade-off between market and organization in terms of efficacy. The choice organizations make depends on two evaluations: the balance between internal organization costs and transaction costs, and the difference between the cost of producing for its own needs and the cost of acquiring the same product on the market. The final decision seeks to minimize the sum of the costs of production and governance. Although it takes into account a cognitive constraint (bounded rationality) and includes a new unit of analysis (the transaction), Williamson's analysis shares with the neo-classical theory a conception of the firm based on choices. As a result, it cannot explain why a certain type of organizational design emerges (it can only say why it is the best), or why, in a world of imperfect information and uncertainty, firms may react in different ways to the same change in the environment.

Far from denying the existence of such trade-offs, the artificialist theory of the firm integrates transaction costs. However, these transaction costs are not used to explain the existence of the firm, but as a criterion on which choices between possible solutions can be based.

3. COGNITIVE OPPORTUNISM AS AN ARTIFICE TO OVERCOME THE COGNITIVE LIMITS OF THE DESIGNER

If the precedent part provided some insights on the nature of the firm, the presents part aims at showing that the artificialist theory of firm leads to integrate a new kind of opportunism: the cognitive opportunism.

3.1 FROM BOUNDED RATIONALITY …

In 1955, Simon made an important contribution to modern behavioral economics. Borrowing a methodology from the field of psychology, he questioned the hypothesis that maximization is a rational behavior. This work led him to refute the concept of perfect rationality, and thus the vision of the omniscient decider, in favor of the concept of bounded rationality, a term he coined to refer to the limits of the decider confronted with a decision-making problem. These limits are the result of knowledge that is imperfect or limited by the environment, and the impossibility for a designer to process all the information and all possible options due to the finite attentional and computational capabilities of the human mind.

Hence, the objective of the concept of bounded rationality is not to show that individuals are irrational in their evaluations and decisions; rather, it is to highlight that the entire range of theoretically available options is never practically accessible, as humans have a limited ability to generate and compare possible actions. By incorporating bounded rationality, the artificialist approach challenges the idea of a vague, imprecise and purely intuitive reasoning, and differentiates between the reasoning underlying design and the reasoning underlying optimization[10].

Taking into account procedural rationality (Simon 1976) led Simon to propose an algorithm of research alternatives, called *search,* whose main components are the *stop rule* and aspiration level[11] (Forest and Mehier 2001). Simon's research algorithm is an artifice that allows decision-makers to deal with their cognitive limits.

3.2. … TO COGNITIVE OPPORTUNISM

The artificialist theory of the firm allows for the existence of such artifices to overcome the cognitive limits of the designer. Experience shows that designers use design tactics, and cognitive opportunism is one of these tactics. Nevertheless, the concept of opportunism embodied in the artificialist approach is different to the opportunism considered by Williamson (1975).

Williamson used the term opportunism to refer to all situations in which an actor hides or intentionally falsifies information. This creates an asymmetry of information between actors[12]. When used in this way, opportunism describes an *ex ante* or *ex post* absence of honesty in transactions. Although artificialism does not deny that this type of opportunism exists, the artificialist theory of the firm also incorporates cognitive opportunism.

In fact, the realization that designers adopt an opportunistic strategy to reduce the cognitive cost of a design problem was first made by researchers in the field of cognitive psychology. What is this opportunistic strategy?

According to Visser (1992, 2006), individuals faced with a problem to solve adopt opportunistic strategies because they have found them to be the most economical way, from a cognitive point of view, of executing the action. Hence, it is rational for a designer to simplify the problem and produce analogies. Complication, methodological doubt and attempts to envisage all possible conditions of use are too costly from a cognitive point of view[13].

Hence, the cognitive opportunism of Visser is very different to the opportunism of Williamson. Cognitive opportunism can be considered positive, in so far as the opportunism is a problem-solving strategy that allows savings to be made. Conversely, the opportunism of Williamson describes situations that generate costs.

4. EVOLUTION OF THE FIRM

4.1 MOTIVATIONS FOR EVOLUTION

The design process acts as the processor of the firm's dynamic, as the existence and future of artifacts are the result of design. As a pragmatist, the artificialist theoretician knows that no design is ever definitive and that no organization can function forever with the same design (Jelinek, Romme and Boland 2008). The evolution of artifacts is motivated by either:

- External motivations: expansion of the objectives that have to be taken into account in order to respond to a potential decrease in performance, new actors with which the organization must inter-operate or compete, etc.,

or

- Internal motivations: recognition that a new internal architecture is conceivable (because there is generally more than one way of designing an "internal system" – the existence of a variety of solutions can even be seen as a characteristic of the design process), the need to perfect the existing concept because the initial objectives are not being achieved, or the recognition that the actors involved do not share the same vision of the world and that their resulting actions are reducing the organization's efficacy. Even if the user of a technical object diverts the use of that object away from the use for which it was originally designed, the new use does not modify either the object itself or its internal structure. In the case of organizational artifacts the situation is different. The actors within an organization and through whom the organization exists can affect the redesign of the organization by developing new models for understanding the organization or by redefining its objectives (and therefore its functions).

Therefore, the evolution of a firm can be read as the resultant of internal and external forces, in other words, of endogenous and exogenous factors. However, it must be stressed that although the artificialist theory of the firm belongs to the school of economic evolution theories that reject the idea of random evolution, this is by no means contradictory with admitting that random events occur[14] (Nelson 1995).

In fact, the artificialist theory of the firm allows for the occurrence of unforeseeable events it cannot explain (e.g., appearance of a new value, conflict or institution). Nevertheless the theory can explain how integrating these events leads the designer to produce alternative concepts[15], and it can do this because it is centered around the tactical dimension of the action, that is to say, around the process responsible for the transition from the formulation of a need to the production, in a finite time, of satisfactory solutions. The dynamic of an artifact depends on the designer and not on an unintentional

and random process over which the designer has no control. In other words, there is no design without intention, and there is no evolution without design.

However, even though the timing of evolution depends on the acuity of the designer, that is to say, on the designer's ability to perceive a new need or a need that is poorly satisfied, the amplitude of the evolution depends on the designer's creativity. The design process may be able to dictate the future of the organizational concept, but it is the creative nature of the design that explains the qualitative leaps that can be observed.

4.2. EVOLUTION AND CREATIVE RATIONALITY

Claiming that the dynamic of an artifact depends on the designer does not signify that the designer is solely responsible for the architecture (which would underestimate the role of collective processes), nor that the designer is considered an omniscient and omnipotent actor. However, the artificialist theory of the firm recognizes the need to build micro-foundations based in "manager-designer" action.

As noted by Jelinek, Romme and Boland "*if organization science as design science is to be intellectually robust, pragmatic and cumulative, it must go well beyond the familiar structural aspects of organizations to include characteristics of human cognition and psychology (...) as well as the myriad cognitive biases oh human designers*" (Jelinek, Romme and Boland 2008:323).

Considering the creative nature of the design process raises the possibility of focusing on the process of creation, which had formerly been equated with non-reason, intuition and the inexplicable (Albert and Runco 2005; Policastro and Gardner 2005; Sternberg and Lubart 2005) and thus on an acting rationality, we call it creative rationality.

Indeed, taking into account the creative rationality leads to the rehabilitation of a form of thought that was formerly barred by the difficulty of defining a form of rationality that is ambiguous by nature and that has long been excluded in favor of analytical rationality in the history of western thought.

This creative rationality, which Vico in his book *De Nostri Temporis Studiorum Ratione* (1709) called ingenium, is a kind of thought that establishes correlation between different perspectives, domains or space of knowledge. It is a form of rationality which does not separate but ties. As Poincaré (1913) noted, "*To create consists of making new combinations of associative elements which are useful*.

(…) *Creative ideas reveal to us unsuspected kinships between other facts well known but wrongly believed to be strangers to one another*" (Poincaré, 1913 *in* Martindale 2005:137). Creative rationality is the faculty to combine and reorganize existing knowledge (Swann and Birke 2005). Its outcome consists of an original, astute and unimaginable result. Thus, taking into account the creative rationality shows why the dynamic of a system of artifacts is not only gradual, it can involve large and rapid leaps[16].

Three points can be highlighted here:

[1] Considering creative rationality leads to a theory of the firm that integrates a positive vision of rationality. By emphasizing the adaptive capacities of the mind, Simon's work has led to theories incorporating a debased image of the rationality involved, that is to say, it emphasizes the limits of acting rationality and minimizes its creative capacity[17].

[2] Many authors have highlighted that the emphasis put on the concepts of learning and path dependence favor adjustment behaviors oriented towards the past. This is not the case with creative rationality, which, on the contrary, reveals new possibilities. Creative rationality thereby breaks with the idea that there is a finite number of given alternatives, as is generally supposed in the theory of evolutionary games (Nelson 1995).

[3] Taking into account creative rationality leads to the rejection of the idea of total determinism.

4.3. EFFECTIVE EVOLUTION CAPACITY OF THE FIRM

The preceding pages outline a number of factors that can restrict the evolution of the firm (ability of the designer to perceive the need for a redesign, representations and strategies of actors within the firm, etc.). However, the importance of a designer's routine, which are based on past experience, should not be overlooked. The implementation of these routines is not independent of the amount of time a designer has to produce a satisfactory solution to a particular problem. By systematically reusing familiar solutions[18], the designer precludes the exploration of new alternatives and loses touch with innovative models. In extreme cases, the routines become so dominant they prevent any innovation, and companies see their competitiveness decline.

As well as acting on the designer, time is also a factor in the implementation of change. In practical terms, it is not easy for a firm to evolve spontaneously; hence, a firm may disappear before its organizational concept has had time to show its effectiveness.

Cost is an important factor in explaining the slowness of evolution, as the costs induced by evolution can produce a reluctance to introduce change. However, cost is not the only explanation for the inertia of companies, as the speed of change is also dependent on how the actors within a company view the opportunity provided by the modifications included in the new organizational concept. Evolution will be even slower when the existing concept was successful (Miller 1990).

Figure 1 : Synopsis of the artificialist theory of the firm

CONCLUSION

The preceding pages provide an outline of an artificialist theory of the firm, in which the firm is viewed as an artifact whose dynamic depends on the design process. By doing this, the artificialist approach focuses on the capacity to design or invent solutions, as opposed to copying solutions used elsewhere.

In this respect, the artificialist theory breaks away from theories of the firm based on choices between existing solutions. This emphasis on the design process allows the artificialist approach to integrate both bounded rationality and creative rationality. In addition, the artificialist approach provides a positive vision of the firm and rejects the idea that firms evolve naturally and automatically, in favor of the notion that they evolve artificially.

As well as taking into account the adaptive character of decisions, a point shared with Nelson and Winter's early work (1982), this artificial evolution also incorporates decision-making and creative processes, which allows it to incorporate alongside past experience the story of the individuals who designed the firm, which, by its nature, is a very "political" story.

If the artificialist theory is to be integrated into theories of the firm, the foundations of the artificialist approach and its position on a number of important questions must be elucidated in more detail than is provided in the present article. For example, is the artificialist framework capable of

integrating economic conflicts of interest alongside the functional and cognitive conflicts of interest included in the theory? How can a designer take into account the contradictory interests of the different stakeholders and how does this translate into the resulting organizational concept?

Finally, it is necessary to enlarge the perspectives of research into creative rationality, which has tended to focus on the constraints surrounding this rationality and the reasoning behind it. In addition, creative rationality must be situated in its historical, cultural and anthropological context, that is to say, in the fields in which it is implemented.

NOTES

1. The idea that social organizations are 'designed' pre-dates 1943. It has been used in American institutionalism since the beginning of the 20th century. J.R. Commons considered the conflict resolution process to be the driving force behind the evolution of institutions, maintaining that this process can be influenced by human will and actions, rather than being something that must be passively endured. However, unlike Simon, Commons did not refer directly to the design process.

2. Taken in isolation, the first proposition may appear self-evident; however, this is not the case when it is linked to the second proposition, that is to say, accepting the existence of a design process.

3. In 1969, Simon listed seven research axes: a theory of evaluation, calculation methods, the formal logic of design, heuristic research, the distribution of resources for research, a theory of structure, and the organization of design, or at least the representation of the problems of design (Simon, 1969).

4. We can trace to Penrose (1959) the foundation of such an approach.

5. As much from the point of view of their nature, volume and origin.

6. The notion of designer is idealized; however, the term is not used to suggest that designers work in isolation, as the omniscient designer does not exist - design is a collective process.

7. Simon illustrated the existence of multiple alternatives, quoting the design of the Marshall Plan, which was introduced by the American Congress after the war and implemented by the Economic Cooperation Administration (ECA): "*The goal of the legislation was to provide the European nations with funds and goods that would enable them to revive their own productive capacities. But there were different ways in which an organization could have been structured to do that. The ECA could have been an organization for processing European shopping lists, validating them, and aiding procurement. That*

was one model. Another, conceiving the ECA as an extension of the State Department, was organized to engage in bilateral negotiations with individual nations to fix the terms on which aid would be offered. A third model – the one followed – conceived the organization as a nucleus around which economic cooperation among the European states could develop, so that they would be led toward a European economy very different from the fragmentation of the pre-War era." (Simon, 1995:256). Applied to the firm it then explains why different organizational concepts exist.

8. The emphasis of the artificialist theory is on the knowledge creation rather on sharing knowledge. Such a point of view has profound implications for the deployment of governance mechanisms (see, Foss, 2007) and the philosphical foundations of knowledge management (See Spender, Scherer, 2007).

9. These frameworks constitute the designer's internal mental models.

10. Some researchers (Winter, 1975) contest the idea that bounded rationality and satisficing, as functions of the adaptive representation employed by designers to allow them to act without being deflected from their end goals (Munier, 1986), are a rule of maximization. As it is peripheral to the current argument, this work is not discussed here.

11. The emphasis Simon put on the adjustable character of aspiration level, especially due to the need to take into account the cost of research, explains the satisfying nature of the solution retained.

12. "By opportunism, I mean a search for personal interest that includes the notion of deceit. The latter includes the most apparent forms, such as lying, stealing and trickery" (Williamson, 1994:70)

13. Contrary to what has long been thought, the design process is opportunist, not hierarchical. The confusion seems to arise from the postulate that because design results in a structured and hierarchical product, its production process must also be hierarchically structured.

14. Although Nelson (1995) believed that an evolutionary theory of economic change requires explanations to include chance, the artificialist concept accepts chance as a possibility, rather than the rule.

15. A parallel can be drawn with the development of hybrid motors. Artificialism cannot explain how the preoccupation with the environment arose. However, starting from needs induced by the emergence of this new value, it can explain how the designers designed and produced alternative artifacts.

16. Leaps cannot be considered "accidents".

17. Of course, Simon discussed the questions of intuition and creative thinking, but he regarded intuition as a simple act of recognition, and he viewed creative thinking uniquely in terms of the imagination presenting the mind with new solutions (Le Masson et al. 2006:98).

18. In order to reduce cognitive effort, as discussed above.

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